NCA
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LASZLO DOSA

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NUCLEAR FUSION PROGRESS

ANNCR:

AMERICAN SCIENTISTS HAVE COME ONE STEP CLOSER TO IMITATING THE ENERGY PRODUCING PROCESSES OF THE SUN -- AND THE PROMISE OF PRACTICALLY UNLIMITED ENERGY. VOA SCIENCE EDITOR LASZLO DOSA PREPARED THIS BACKGROUND REPORT.

VOICE:

PRINCETON UNIVERSITY SCIENTISTS HAVE REPORTEDLY SUCCEEDED IN GENERATING A TEMPERATURE OF SIXTY-MILLION DEGREES CELSIUS IN AN EXPERIMENTAL DEVICE, CALLED TORUS TOKAMAK, WHICH MAY SERVE AS MODEL FOR A FUTURE NUCLEAR FUSION POWER PLANT. THE PRINCETON DEVICE, BUILT ON A CONCEPT ORIGINALLY DEVELOPED IN THE SOVIET UNION, CONSISTS OF A THREE-METER WIDE, NINETY CENTIMETER HIGH CONTAINER, SHAPED IN THE FORM OF AN AUTOMOBILE TIRE. IT ENCLOSES A SMALLER CONTAINER, FILLED WITH PLASMA.

PLASMA HAS BEEN CALLED THE FOURTH STATE OF MATTER, THE OTHER THREE BEING GAS, LIQUID AND SOLID. IN ACTUAL CONTROLLED NUCLEAR FUSION, THE PLASMA WILL BE MADE OF A SPECIAL FORM OF HYDROGEN ATOM, KNOWN AS DEUTERIUM, WHICH IS MUCH HEAVIER AND MORE DENSE THAN ORDINARY HYDROGEN. WHAT SCIENTISTS ARE TRYING TO ACCOMPLISH IS TO HEAT THIS PLASMA TO EXTREMELY HIGH TEMPERATURES WHICH WOULD CAUSE THE HYDROGEN ATOMS TO FUSE TOGETHER INTO HELIUM AND RELEASE TREMENDOUS AMOUNTS OF ENERGY. THIS IS WHAT OCCURS WHEN A HYDROGEN BOMB IS EXPLODED, BUT THE CHALLENGE HAS BEEN AND REMAINS TO HARNESS THAT UNCONTROLLED EXPLOSIVE POWER, CHANNELING IT INTO A USEFUL, NON-DESTRUCTIVE FORM OF ENERGY.

THE TOKAMAK TORUS DEVICE USED IN PRINCETON IS ONE OF SEVERAL APPROACHES TO CONTROLLED THERMONUCLEAR FUSION. IN EACH APPROACH, THREE DISTINCT AND DIFFICULT PROBLEMS MUST BE SOLVED. THESE ARE: TO GENERATE A HIGH ENOUGH TEMPERATURE; TO CONFINE THE PLASMA, AND TO MAINTAIN ITS DENSITY. IN THE UNITED STATES AND IN OTHER COUNTRIES, NOTABLY THE SOVIET UNION, SCIENTISTS ARE WORKING FROM SEVERAL DIRECTIONS TOWARD THE SAME GOAL. IT IS AN EXTREMELY SLOW AND PAINSTAKING PROCESS, WITH THE PRACTICAL RESULT -- COMMERCIAL SCALE PRODUCTION OF ENERGY -- SEVERAL DECADES IN THE FUTURE.

REACHING THE SIXTY-MILLION DEGREE TEMPERATURE IN PRINCETON HAS BEEN A SIGNIFICANT STEP, THE FIRST TIME SUCH TEMPERATURE HAS BEEN GENERATED WITH A TORUS -- AUTOMOBILE TIRE-SHAPED -- DEVICE. OTHER SCIENTISTS, WORKING WITH DIFFERENT INSTRUMENTS, HAVE ALREADY REACHED A SIMILAR STEP. AT THE LAWRENCE LIVERMORE LABORATORY IN CALIFORNIA, FOR EXAMPLE, THEY HAVE MANAGED TO PRODUCE -- FOR A MOMENT -- TWICE AS HIGH A TEMPERATURE, BUT HAVE DIFFICULTIES IN MAINTAINING THE REQUIRED PLASMA DENSITY.

WE ARE STILL VERY FAR -- PERHAPS FORTY YEARS AWAY -- FROM THE DAY WHEN HYDROGEN IN THE OCEANS WILL PROVIDE AN INEXHAUSTIBLE SOURCE OF RAW MATERIAL FOR THE PRODUCTION OF FUSION ENERGY.

(OPT) COMMENTING ON THE LONG-TERM OUTLOOK FOR FUSION POWER, A U.S. DEPARTMENT OF ENERGY OFFICIAL RECALLED TEH WORDS OF A CODED MESSAGE A THIRD OF A CENTURY AGO, ANNOUNCING THE FIRST SUCCESSFUL SPLITING OF THE ATOM. THAT MESSAGE SAID: "THE ITALIAN SAILOR HAS LANDED." AS FAR AS CONTROLLED FUSION IS CONCERNED, SAYS THIS OFFICIAL TODAY, "THE ITALIAN SAILOR HAS NOT EVEN SET SAIL YET."

(END OPT)

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